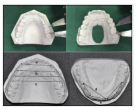
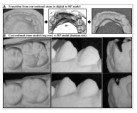
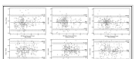

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Techno bytes

Comparison of reconstructed rapid prototyping models produced by 3-dimensional printing and conventional stone models with different degrees of crowding

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Highlights

- Three-dimensional printing (3DP) and conventional study models were compared.
- Measurements were generally significantly different regardless of the type of crowding.
- The mean biases were within ±0.15 mm (SD, <0.40 mm) but were significantly different (P <0.05).
- The 95% limits of agreement were beyond the acceptable clinical significance set at ±0.50 mm.
- The 3DP models produced were not clinically acceptable alternatives for linear measurements.

Introduction

Rapid prototyping models can be reconstructed from stereolithographic digital study model data to produce hard-copy casts. In this study, we aimed to compare agreement and accuracy of measurements made with rapid prototyping and stone models for different degrees of crowding.

Methods

The Z Printer 450 (3D Systems, Rock Hill, SC) reprinted 10 sets of models for each category of crowding (mild, moderate, and severe) scanned using a structured-light scanner (Maestro 3D, AGE Solutions, Pisa, Italy). Stone and RP models were measured using digital calipers for tooth sizes in the mesiodistal, buccolingual, and crown height planes and for arch dimension measurements. Bland-Altman and paired t test analyses were used to assess agreement and accuracy. Clinical significance was set at ±0.50 mm.

Results

Bland-Altman analysis showed the mean bias of measurements between the models to be within ±0.15 mm (SD, ±0.40 mm), but the 95% limits of agreement exceeded the cutoff point of ±0.50 mm (lower range, −0.81 to −0.41 mm; upper range, 0.34 to 0.76 mm). Paired t tests showed statistically significant differences for all planes in all categories of crowding except for crown height in the moderate crowding group and arch dimensions in the mild and moderate crowding groups.

Conclusions

The rapid prototyping models were not clinically comparable with conventional stone models regardless of the degree of crowding.